

## MULTIFUNCTIONAL URBAN COMPLEX

### FIELD OF THE INVENTION

The invention refers to multifunctional urban complex intended for civil engineering application in urban conditions for the provision of usable areas.

### BACKGROUND OF THE INVENTION

A multifunctional urban complex is known in the art, consisting of a yard situated between surrounding roadways and railed off by a fence with entrance door seeing to the yard. There is a school building erected in the yard and an area for sports, games and common activities is shaped. There is at least single-storeyed underground construction, situated completely under the yard level. The construction has an approach connected to the roadways. The approach area is located remotely from the entrance door of the yard's fence. The underground construction is designed with reinforced build-in plates. The connection of the approach with the roadway is made with a ramp to provide antifire protection. The underground construction is equipped with security system, antifire system, drain, ventilation and filtration systems, as well as lightning systems independent from those of the school building. [1]

The shortcomings of the multifunctional urban complex known in the art are that substantial investments are needed for the use of reinforced build-in plates, the supply of these plates to the site being very difficult due to the place they have to be installed, i.e. in the city centers, where the roadways are relatively narrow and do not allow the use of heavy construction machines for the supply of reinforced build-in plates that are large in size, i.e. covering the

distance between the center lines. Control of unauthorized malevolent access to the construction is not provided with the given civil engineering solution.

A construction of underground garages is known in the art, consisting of bottom slab and multiple precast reinforced concrete walls, mounted laterally on the bottom slab, with an entrance shaped in the walls for access of the vehicles in the garage. The supporting intermediate pillars are arranged regularly in both directions and a monolithic ceiling slab is cast over them with its supporting beams. The beams are set on the pillars and are arranged in a perpendicular direction to the way of the vehicles from the entrance to the bottom of the garage. [2]

The shortcomings of the cited structure consist in the fact that it is intended for one-storey garages only, determined by the connections between the ceiling slab and the columns. Thus the location of the monolithic beams transversely to the base line of vehicle motion supposes a definition of a substantial construction height which makes it very expensive. The need to fix on place the installation pillars so that the concrete of the ceiling slab and over the beams could be cast simultaneously is another factor that makes the construction extremely expensive and very difficult to erect. The monolithic structure of the construction extends the period of its erection, which makes it difficult to apply in the central urban areas.

## SUMMARY OF THE INVENTION

The invention is intended to create a multifunctional urban complex allowing the formation of a multifunctional structure in densely populated city areas, providing a space to be used without disturbing the architectural outlook of the city, making possible the erection works in the narrow central parts of the city and providing convenient communications and good safety with the possibility to erect in a short time and with relatively low costs the construction.

A solution to this task has been found with the multifunctional urban complex that comprises a yard located between surrounding roadways and railed off by a fence with entrance door seeing to the yard. A school building is located in

the yard and an area for sports, games and common activities is provided. In this area, and under the yard level there is a structure to which an approach is given, connected to the roadways remote from the entrance door in the yard's fence. The construction according to the invention is at least two-storeyed with an at least single-storeyed building over the ground level in the approach area. The at least two-storeyed construction comprises reinforcing walls, supporting intermediate pillars and floor panels standing on supporting beams. The length of the supporting intermediate pillars corresponds to the height of at least two-storeyed building, and the supporting intermediate pillars have also short consoles on the place of the floor. The supporting intermediate pillars are arranged in rows parallel to the basic traverse line. The bearing intermediate pillars are restrained in monolithic footings on foundations by their bottom ribbed end placed in preliminary prepared cups encompassing this ribbed end. The cups have internal ribbed surface and partial outer ribbing in its bottom part which is monolithically fixed in the monolithic footings. The short consoles of the bearing intermediate pillars are directed parallel to the basic traverse line, and the bearing beams are mounted to them in the same direction. The bearing beams have longitudinal footings on which footings the floor panels are fixed. The floor panels are prestressed cast fitting together elements with longitudinal cavities.

The distance between the center lines of the two rows of bearing intermediate pillars shall preferably be greater than the distances between the other centre lines.

It is convenient that the bearing intermediate pillars should be of square cross section.

The approach should preferably include a ramp.

The approach should preferably comprise at least one elevator cage and/or staircase for disabled people.

It is possible that the approach could have a shop section.

The invention allows to preserve the architectural, urbanization and space structure of the city, making optimal use of the urban territories and the available construction density. A possibility is created for multifunctional use of the school yards underground, included for the need of the education process and the needs of the society. The rate of use of the city areas is increased. Simultaneously, the school building remains with its yard to be used according to the urbanization planning available, completely safe and wide enough, with novel pavement, geoplastics, garden design, sculptures, playing spots, etc. The mutual disposition of the elements in the multifunctional urban complex and the construction peculiarities of the underground structure allow its building not only as a new construction, but as an ancillary too, which may be fulfilled for a short period of time and does not affect the existing functions of the surrounding buildings and equipment, preserving the underground urban infrastructure too. There is a high level of completeness of the construction, and no finishing works are needed after the installation of the supporting elements. The specialized entrance available with access control equipment provides the safety use of the complex.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention is clarified with an example illustrated on the figures attached, where

Fig. 1 is a top view of the multifunctional urban complex according to the invention;

Fig. 2 is an architecture model of one floor of the underground structure of the urban complex for the case when it is intended for garage;

Fig. 3 is section A-A of fig. 1;

Fig. 4 is a partial construction drawing of the location of the bearing elements of the structure;

Fig. 5 is a vertical section along B-B of fig. 4;

Fig. 6 is detailed drawing B of fig. 5;

Fig. 7 is detailed drawing D of fig. 5;

Fig. 8 is view along E-E of fig. 7.

## DESCRIPTION OF THE PREFERRED EMBODIMENTS

The multifunctional urban complex according to the invention comprises a yard 1, situated between surrounding roadways 2 and railed off by a fence 3 with entrance door 4 seeing to the yard, in which yard 1 a school-building 5 is situated and a sports-, play- and common activities zone is shaped Fig. 1-3. There is at least two-storeyed construction 7 in the yard 1 intended in the preferred embodiment for garage. The at least two-storeyed construction 7 occupies a space 8, located under the level of the yard 1 in its area 6 intended for sports, games and common activities. This construction may be situated depending on the reinforcing methods used, i.e. distance from the outline 9 of the school-building 5. It is appropriate that this distance is at least 3 meters in view of increasing the safetiness not only with regards to the technologic aspect, but with regards to the use too. The at least two-storeyed construction 7 is underground and has an approach 10 that is situated on the distant side of the entrance door 4 of the fence 3 of the yard 1 of the school-building 5: figures 1 and 3. The at least two-storeyed construction in the area of the approach 10 has at least one floor over the ground level 11. This ground floor shall be preferably located in the school yard 1 which does not ignore other possibilities too. The at least one ground floor 11 is intended for the location of access checkpoints to the underground part of the at least two-storeyed construction 7, as well as the placement of a staircase and elevator for disabled people and/or shops. In the preferred embodiment shown in figures 1 and 3 the outline of the at least two-storeyed construction 7 match the outline of the fence 3. This is possible in all individual cases of location of the school-building 5 in the yard 1, although it is not the only possible way to dispose the at least two-storeyed construction 7. It may be located so that its outline does not match the fence outline 3. In the example of fig. 2 and 3 the at least two-storeyed construction 7 comprises reinforcing walls 12, bearing intermediate pillars 13 and floor panels

14, placed on bearing beams 15. The length of the bearing intermediate pillars 13 in the case shown corresponds to the length of the at least two-storeyed construction 7. They have short consoles 16 on the place of the floor. If there are three or more floors, the bearing intermediate pillars 13 may be erected as high as several floors which is however limited by the possibilities to transport them in the central urban zone for which this invention is intended. If the erection of a multi-storeyed building is needed, the bearing intermediate pillars 13 may be composed by various elements placed one over the other that may be fit together (not shown). This solution shall be used if the conditions imply it. The bearing intermediate pillars 13 may have a differently shaped cross section, selected in accordance with the calculated loadings for this size. In the preferred embodiment (fig. 4) they have a square section because this makes easier their transportation and fitting. The bearing intermediate pillars 13 are arranged in rows parallel to the basic traverse line 17 where the centre line distance 18 of both rows of bearing intermediate pillars 13 shaping the basic traverse line 17 is greater than the other centre distances 18. The bearing intermediate pillars 13 are retained in monolithic footings 20 on foundations by their bottom ribbed end 21, placed in preliminary prepared cups 22 encompassing this ribbed end 21 (fig. 5). The cups 22 have an internal ribbed surface 23 and partial outer ribbing 24, shaped in its bottom end, which is restrained in the monolithic footings 22 (fig. 6). The short consoles 16 of the bearing intermediate pillars 13 are directed parallel to the basic traverse line 17 and the bearing beams 15 are mounted to them in the same direction. The bearing beams 15 have longitudinal footings 25 on which footings the floor panels 14 are fixed. The floor panels 14 are prestressed precast elements with longitudinal cavities 26. To the at least two-storeyed construction 7 in the preferred embodiment the approach 10 is traced to every floor that may be connected directly to the roadway 2 or to be one to all floors (fig. 1 and 3). Multiple versions to perform the connections are possible, however preferred for antifire reasons is the connection by means of ramps 27 that may be monolithic or made by fitting together elements. In the approach 10 area the bearing intermediate pillars 13 may have a longer length enlarged with the length of the storey, their upper part being on the ground level with a cover of a

known kind. As a version in this area may be erected additional overground pillars of another known kind that shall be installed independent of the bearing intermediate pillars 13 of the at least two-storeyed construction 7 with their corresponding cover. The at least two-storeyed construction 7 shall be equipped with safety system, and anti-fire, ventilation and filtration systems, with lightning and drain systems that are not shown on the figures, independent of this school-building 5. Besides the security provision for emergency cases this detachment of the indicated systems allows the accomplishment of additional activities in the premises of the underground construction 7, i.e. car cleaning and washing, eventual sale of some spares and needed accessories, etc.

#### APPLICABILITY OF THE INVENTION

The invention is intended for application in densely populated cities and central city areas and may be fulfilled as a new construction and as an additionally inserted structure as it is indicated in the preferred embodiment when done in the following succession:

The available pavement (not shown) of the school yard 1 is removed and excavation works are made for the underground structure 7. The earth extracted is transported to a place designated for that purpose, performing simultaneously reinforcement depending on the depth of the excavation and its proximity to the school-building 5 and various surrounding units if any. Then the at least two-storeyed construction 7 is erected. The supporting walls 12 are erected following the monolithic way and, as usual, the monolithic footings 20 for the bearing intermediate pillars 13 are cast, simultaneously in them are restrained the preliminary prepared cups 22 with inner 23 and partial outer ribbing 24, restraining into the monolithic footings to the level of the partial outer ribbing 24. Then the bearing intermediate pillars 13 are installed into the monolithically attached cups 22, being also monolithically attached there. The bearing beams 15 are arranged and their connection to the short consoles 16 of the bearing intermediate pillars 13 is effected in the known way (preferably by welding). Over the bilateral longitudinal footings 25 of the bearing beams 15 the floor panels 14 are installed so that their longitudinal cavities 26 are placed

transversely to the bearing beams 15 thus making their connection. Then the preferred flooring 28 is made. The connections may be made following any of the known ways, however a monolithic connection is preferred. Finally over the last underground level of the at least two-storeyed construction 7 the required pavement is placed, which may be bitumen, „zebran“, tiles etc. laying underneath and on the last underground level of the at least two-storeyed construction 7 the corresponding hydroinsulation is laid. It is possible to perform the herewith stated operations for approximately 90 days so that the vacation period of the students could be used without interrupting the regular use of the yard during the education process. The operations of fulfillment of the equipment of the garage and the internal engineering structures are placed in the already outlined space 8 and are detached and independent from the school-building 5 and the yard 1. It is convenient to use electronic systems indicating available parking places. The approach 10 to the underground construction 7 that in this preferred embodiment is a garage has a signal system and is specially secured. The cars of the living in the neighbourhood or of the teachers and students may find place here, as well as cars that visit the central metropolitan area for a part of the day, for which a special regulation may be considered. Thus the problem of cars theft and their equipment is solved as they do not remain on the street.

The preferred embodiment described illustrates only one application of the urban complex according to the invention. A lot of other useful for the society spaces may be created in the included in the complex at least two-storied construction 7. The space shaped this way may be used also as exhibition area or a trade center, sports facilities, for common or refrigerated warehouses, computer halls and halls for connection to the global network, civil protection shelters, not requiring sun light industrial premises etc. If used for garages it gives chance to provide a safe access of the students to the school yard and building as the underground construction is approached from the distant side.

[1] BG 556 Y

[2] JP 8004343